Temporal Analysis of S-band Monostatic Sea Clutter at the Low Grazing Angles

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Monostatic radar returns from a time-varying ocean surface are distributed into a spectrum through the Doppler effect. This phenomenon has strong implications for various radar and remote sensing systems such as moving target indication, altimetry and others. Numerous studies have been published about the Doppler spectra of sea clutter returns. However, the temporal characteristics of Doppler spectra at low grazing angles need to be analyzed in more detail. In this presentation, the Doppler phenomena from time-varying sea clutter observed at low-grazing angles will be discussed. The sea clutter data was collected at Cape Point, South Africa by University College London with an S-band radar system operating at 2.4 GHz with 45 MHz bandwidth, and a pulse repetition frequency of 1 kHz. The Doppler spectra of the scattering from the sea surface are estimated using the periodogram. Peak and width of the Doppler spectra are analyzed to understand the behavior of Doppler spectra depending on radar geometry and wind direction. The peak Doppler frequency and Doppler centroid from the spectra are estimated to retrieve the Doppler frequency shift induced by the motion of the sea surface. The Doppler spectral width is compared with the associated decorrelation time and standard deviation of the spectrum. In addition, time-varying Doppler spectra and range-resolved Doppler spectra are investigated using Doppler spectrograms and range-Doppler maps, respectively.